

components such as hydrogenated or partially hydrogenated vegetable oils or animal fats in an amount of 5-50%, and filler (mineral adjuvants) in an amount of 5-40%, in order to allegedly achieve an adhesive or non-tacky base. Indeed, the use of filler with polyisobutylene/polyvinyl acetate in gum base is considered common practice in the art.

Through the present invention, however, polyisobutylene can be combined with the characteristically good film-forming high molecular weight polyvinyl acetate to form a gum base of soft consistency in the absence of not only filler, but also other softening additives usually included in polyisobutylene such as hydrogenated or partially hydrogenated animal fats or vegetable oils.

Furthermore, with respect to the use of isobutylene-isoprene copolymer (butyl rubber), by use of the present invention, a soft gum base with good film-forming characteristics has been achieved in the absence of both ester gums and filler thus making it useable as a bubble gum base.

Therefore, by means of the present invention, many of the problems associated with compounding a desired gum base can be overcome by a rational, technical approach, which, in effect, reduces the trial-and-error method of making gum to a predictable science.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with the present invention, a gum base is provided which is formed essentially of a properly plasticized elastomer, such as, for example, a styrene-butadiene copolymer plasticized as described hereinafter; a properly plasticized resin, such as, for example, polyvinyl acetate, as described hereinafter; and, optionally, a third emulsifying/softening/texturizing component which may include all other adhesive and adhesive types of components generally used in gum base, for example, fillers, such as calcium carbonate or talc, and/or waxes (natural or synthetic) (hydrocarbon or ester type), fatty acids and fatty acid esters, antioxidants, oils, resins (ester gums, polyterpene) and the like. Optionally, fillers such as calcium carbonate and talc, and/or wax can be included in any one or all three components to achieve a desired result.

Based on proper plasticization principles a model gum base formulation scheme has been devised whereby an elastomer such as SBR, polyisobutylene, and isobutylene-isoprene copolymer and a resin such as polyvinyl acetate can be blended in the appropriate proportions to attain the proper texture, resiliency, flavor retention properties, etc. without regard for the necessity of including extraneous ingredients required to make them compatible and/or workable.

Based on previously-espoused theories it has not been considered feasible to render a SBR chewing gum base with film-forming properties in the absence of ester gums, or a PIB/PVAC gum base in the absence of filler and other additives, or a butyl rubber base useable in a bubble gum composition. By means of the present invention, however, excellent film-forming resins such as high molecular weight polyvinyl acetate, i.e., in excess of at least about 20,000 M.W.U., can be made miscible with SBR, PIB, and butyl rubber. In view of the application of solubility theories to the compatibilizing of these primary polymer components this is quite unexpected. Specifically, the primary resin, high molecular weight polyvinyl acetate, has a solubility parameter of approximately 10.6 (Collins, Bares, and Billmeyer, Jr., "Preliminary Evaluation of Polymer Properties," Ex-

periments in *Polymer Science*, page 108 (1973)), whereas the solubility parameter of styrene-butadiene copolymer is approximately 8.3, and polyisobutylene is approximately 7.8 (Bandrup and Immergut, "Solubility Parameter Values," *Polymer Handbook*, pg IV-362-IV-365 (3d ed. 1967), which theoretically renders them somewhat incompatible and, at least, immiscible.

The elastomer component of the gum base of the invention can contain primarily styrene-butadiene copolymer, polyisobutylene, isobutylene-isoprene copolymer, natural rubber (polyisoprene) as well as other masticatory substances of natural origin, such as rubber latex solids, chicle, crown gum, nispero, rosidinha, jelutong, pendare, perillo, niger gutta, tunu, etc. The elastomer is employed in an amount within the range of from about 0.5 to about 30%, and preferably from about 5% to about 20% by weight of the gum base.

To achieve proper plasticization of the elastomer component in order to gain compatibility, several chemical compounds have been discovered to provide surprisingly good plasticization and/or compatibilization of the elastomer with other components, especially resin components.

DETAILED DESCRIPTION OF THE INVENTION

In the preferred embodiments of the present invention, it has been found that plasticization can be achieved with unique gum base component plasticizers, such as oleic acid and butyl stearate, although any of the following gum plasticizers may be employed: mono-, di-, or triglyceryl esters of saturated or unsaturated fatty acids, such as stearic acid, palmitic acid, oleic acid, caprylic acid, capric acid, caproic acid, lauric acid and the like, squalene, mineral oil and liquid petroleum hydrocarbons, squalane, castor oil and other ricinoleate derivatives, diethylene or propylene glycols and derivatives, tributyl acetyl citrate, tributyl citrate, lecithin, coconut oil, glyceryl tributyrates, Zn laurate, Ca stearate, propylene glycol monostearate, propylene glycol monolaurate, fatty acids, butyl sebacate, butyl benzyl sebacate, diacetyl tartaric acid esters of mono- and diglycerides of edible fat oils or edible fat forming acids, petrolatum, stearyl monoglycerides citrate, limonene, polylimonene, polyethylene, butyl lactate and butyl oleate.

Preferably, the styrene-butadiene copolymer is plasticized by use of butyl stearate, glyceryl trioleate, oleic acid, butyl oleate, and butyl benzyl sebacate.

In the case of polyisobutylene, polyisoprene, and isobutylene-isoprene copolymer the preferred plasticizers include polylimonene, petrolatum, mineral oil, squalane, squalene, and liquid hydrocarbons.

The primary resin component used in the present invention is high molecular weight polyvinyl acetate, i.e., at least about 20,000 M.W.U. Other resins which may be employed herein, depending upon the properties desired in final gum base, may include polyvinyl butyl ester, copolymers of vinyl esters and vinyl ethers, polyethylene, ethylene-vinyl acetate copolymers, vinyl acetate-vinyl alcohol copolymers, vinyl acetate-vinyl laurate copolymers. The resin component of the gum base can be present in an amount of from about 5 to about 75% of the gum base and preferably constitutes from about 10 to about 45% by weight of the gum base.

As set forth above high molecular weight polyvinyl acetate is the preferred resin, especially where the gum base is to be used in a bubble gum. In this case, the resin